A Switch for Controlling a Range of Movement

Field of the invention

[0001] The present invention relates to a switch for controlling the range of movement of (for example) a garage door.

Background of the Invention

[0002] US-A-4147073 discloses a reversible motor that drives a main screw to rotate reversibly and drive a nut slider to move axially. The slider is connected to a garage door. A second screw is coaxially connected to the main screw and the screw-pitch thereof is small. The switch actuator on the second screw only moves axially to make the garage door move up and down (*ie* open and close).

[0003] US-A-5299678 discloses an adjustable limit switch mechanism to control the operation of the electric motor of a garage door opener to make the garage door move in a selected range. The switch mechanism comprises a screw driven by the electric motor and at least one switch actuator disposed on the screw which is adjustably positionable. When the screw rotates, the switch actuator does not rotate with the screw and moves only axially. A limit switch is adjacent to the screw so that when the screw rotates, the switch actuator moves axially on the screw to actuate the limit switch thereby causing the motor to operate or stop. These two switch mechanisms are remotely disposed at the respective ends of the screw so that the range of movement is difficult to adjust. Furthermore, the two switch mechanisms are linear and cannot directly control the range of movement of the screw.

Summary of the Invention

[0004] The object of the present invention is to provide a switch which may directly control a linear range of movement rotationally.

[0005] In accordance with the present invention, there is provided a switch for controlling a range of movement which comprises a plate and a rotatable block. A rotatable shaft is fixed at a central axis of the rotatable block and is rotatably disposed relative to the plate. The plate fixes a first electrolinking point and a second electrolinking point which are spaced apart from each other by a certain distance. One end of a spring plate is fixed to the first electrolinking point, a middle portion of the spring plate is abutted against a circumferential edge of the rotatable block and the other end of the spring plate adopts two working positions with respect to the second electrolinking point. In one working position, the other end of the spring plate contacts the second electrolinking point and in the other working position, the other end of the spring plate is disconnected from the second electrolinking point. The circumferential edge of the rotatable block forms a radial projection or hollow. As the middle portion of the spring plate moves in and out of contact with the radial projection or hollow, the working position of the other end of the spring plate is changed.

[0006] An advantage of the present invention with respect to the prior art is that the relative position of the rotatable block and the plate is changed by rotation of the rotatable shaft so that the first electrolinking point is electrically connected to or disconnected from the second electrolinking point thereby obtaining the function of a switch for controlling range of movement and applicable for limiting a linear range of movement rotationally.

[0007] In a preferred embodiment, the circumferential edge of the rotatable block forms a depressed cutout and the middle portion of the spring plate forms a projection substantially conforming with the depressed cutout so that during rotation of the rotatable shaft and rotatable block when the projection engages the depressed cutout the other end of the spring plate contacts the second electrolinking point and when the projection disengages the depressed cutout the other end of the spring plate disconnects from the second electrolinking point.

[0008] In a preferred embodiment, the plate comprises an upper worm wheel disposed coaxially with a lower worm wheel which respectively engage an upper worm gear rotationally disposed on the base and a lower worm gear rotationally disposed on the base. Since these portions of the plate are arranged together, the switch is readily adjusted.

Brief Description of the Drawings

[0009] Fig. 1 is a main cross-sectional view of an embodiment of the present invention;

[0010] Fig. 2 is a right view of the embodiment of the present invention;

[0011] Fig. 3 is a cross-sectional view taken along line A-A of Fig. 1;

[0012] Fig. 4 is a cross-sectional view taken along line A1-A1 of Fig. 1; and

[0013] Fig. 5 is a cross-sectional view taken along line A2-A2 of Fig. 1;

Detailed Description of the Invention

[0014] In the Figures is illustrated a switch for controlling the range of movement of (for example) a garage door which comprises a plate and a rotatable block 7. A rotatable shaft 4 is fixed at the central axis of the rotatable block 7 and is rotatably connected to the plate whilst being seated in a sliding bearing 17 in a base 1 to permit rotation. The rotatable shaft 4 and rotatable block 7 are driven simultaneously by a drive mechanism (not shown) during opening and closing of a garage door.

[0015] The plate comprises an upper worm wheel 5 disposed coaxially with a lower worm wheel 6 which respectively engage an upper worm gear 3 and a lower worm gear 2 secured to the base 1. Each of the upper worm wheel 5 and lower worm wheel 6 fixes a first electrolinking point 11 (see Figure 4) and a second electrolinking point 12 which are mutually spaced apart. A first end of a spring plate 8 is fixed and electrically connected to the electrolinking point 11. A second end of the spring plate 8 has two working positions with respect to the electrolinking point 12. In a first working position, the second end of the spring plate 8 contacts the electrolinking point 12 and in a second working position the second end of the spring plate 8 disconnects from the electrolinking point 12.

[0016] The middle portion of the spring plate 8 is generally abutted against a circumferential edge of the rotatable block 7. The circumferential edge of the rotatable block 7 has a depressed cutout 9 shown in Figure 4 and the middle portion of the spring plate 8 is a projection 10 substantially conforming with the depressed cutout 9. As the middle portion of the spring plate 8 engages/disengages the depressed cutout 9 of the stationary plate during rotation of the rotatable

block 7, the working position of the second end of the spring plate 8 is changed. In other words, when the projection 10 of the middle portion of the spring plate 8 engages with the depressed cutout 9, the second end of the spring plate 8 contacts the electrolinking point 12 and a signal is sent to a processor to indicate that the garage door has reached its limiting position (fully open or closed) and the motor is stopped. As the rotatable block 7 counter rotates relative to the stationary plate, the outer circumference of the rotatable block 7 pushes the spring plate 8 out so that the second end of the spring plate 8 disconnects from the second electrolinking point 12.

[0017] By adjusting the positions of engagement of the upper worm gear 3 with the upper worm wheel 5 and/or the lower worm gear 2 with the lower worm wheel 6, the distance between the projection 10 and the depressed cutout 9 is changed thereby changing the range of movement defined by the switch. In other words, the two limiting position (*ie* fully open and closed) of the switch may be conveniently and independently adjusted by the upper worm gear 3/upper worm wheel 5 and the lower worm gear 2/lower worm wheel 6 respectively. This makes the switch versatile in the sense that it may be used with garage doors of different heights.

[0018] The entire disclosure of Chinese Patent Application No. 02264324.9 filed September 10, 2002 is incorporated by reference.